

**Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554**

In the Matter of

Wireless Telecommunications Bureau seeks
comment on petitions regarding the use of signal
boosters and other signal amplification techniques
used with wireless services

WT Docket No. 10-4
Released Jan 6, 2010

**COMMENT
MILLARD/RAINES PARTNERSHIP
("SMART BOOSTER")**



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Introduction

Smart Booster is pleased to submit comments concerning the licensing and operation of consumer grade signal boosters pursuant to FCC Rules.

It will be readily shown that present CMRS rules do not in any way, shape, or form permit *broadband* signal booster operation, whether by subscribers or individual CMRS licensees. The present generation of broadband signal boosters is operating in violation of numerous FCC rules and consequently interferes with CMRS networks. Network interference directly attributable to broadband signal booster use continues to worsen, absent meaningful FCC action in WT Docket 10-4.

Citing FCC Rules, official definitions, and fundamental engineering principles, it will be shown that even CMRS licensees are prohibited from operating broadband signal boosters on spectrum licensed exclusively to their peers.

We again ask the Commission to revoke the OET certifications of all broadband booster devices that are incapable of compliance with existing rules.

Broadband Signal Boosters Are Not Authorized Under the Same Blanket Licensing as Handsets.

A filing by Russell D. Lukas, attorney for Wilson Electronics, dated March 8, 2010, argues that, pursuant to its own legal opinion, "*current law permits wireless service subscribers in good standing to use or operate signal boosters*".¹ In particular, he cites FCC Rule 1.903 (c) as the foundation for his argument:

"*Subscribers.* Authority for subscribers to operate mobile or fixed stations in the Wireless Radio Services, except for certain stations in the Rural Radiotelephone Service, is included in the authorization held by the licensee providing service to them. Subscribers are not required to apply for, and the Commission does not accept, applications from subscribers for individual mobile or fixed station authorizations in the Wireless Radio Services."

It is seen that Mr. Lukas' opinion is based entirely upon the incorrect assumption that a broadband signal booster is a "mobile station". It is not,

¹ Reply Comments of Wilson Electronics. WT-10-4, March 8, 2009, pg. 3

nor, as will be explained in detail, is the combination of a booster and a handset a “mobile station”.

Broadband signal boosters of the type presently marketed by Wilson and other manufacturers conform exactly to the FCC definition of External Radio Frequency Power Amplifiers (“ERFPA’s”).² In a BDA, two such amplifiers are placed back-to-back typically within a single physical enclosure and then sold to CMRS subscribers, often as complete kits including antennas, cables, and power supplies. Wilson offers some models packaged as cradle-type units. Regardless of the manufacturer, packaging or ancillary items included in the retail box, the amplifying components of the products function as ERFPA’s and not as mobile stations, as those terms are defined in FCC rules.

The critical differences between a broadband signal booster and a mobile station will be examined in greater detail in the sections that follow. Because broadband signal boosters are not mobile stations, Rule 22.927 does not authorize or legitimize their use. They are therefore operating without a license in direct contravention to Section 301 of the Act and 47CFR1.903.

Even Carriers Are Not Authorized to Use Broadband Signal Boosters!

An examination of the Rules finds no authority for CMRS carriers to deploy broadband signal boosters that are intended to amplify the spectrum licensed to other CMRS carriers.³ For example, Verizon is not authorized under the Rules to deploy broadband signal boosters that amplify AT&T’s spectrum and vice-versa. Indeed, if this were the case, it would render the entire FCC licensing scheme of CMRS providers meaningless.

As further proof of the above, we remind the Commission that the CMRS Radio Station Authorizations explicitly prohibit CMRS carriers from broadcasting on spectrum that is not allocated to them under the Authorization. For example, CMRS Station Authorization KNKN370⁴ granted to “Cellular Inc. Financial Corporation” (Verizon) includes the following Conditions on the grant of authorization:

² See 47CFR2.815

³ The term “broadband signal boosters” as used in this section excludes distributed antenna systems (“DAS Systems”) operated jointly by two or more CMRS licensees. However, even in this case, the jointly operated DAS system can not rebroadcast the signals of non-participating CMRS carriers.

⁴ See: <http://wireless2.fcc.gov/UlsApp/UlsSearch/license.jsp?licKey=13133> All CMRS licenses of which we are aware include the Condition described above.

Conditions:

Pursuant to §309(h) of the Communications Act of 1934, as amended, 47 U.S.C. §309(h). this license is subject to the following conditions: This license shall not vest in the licensee any right to operate the station nor any right in the use of the frequencies designated in the license beyond the term thereof nor in any other manner than authorized herein. Neither the license nor the right granted thereunder shall be assigned or otherwise transferred in violation of the Communications Act of 1934, as amended. See 47 U.S.C. § 310(d). This license is subject in terms to the right of use or control conferred by §706 of the Communications Act of 1934, as amended. See 47 U.S.C. §606.

Quite clearly, the station authorization held by the carrier allows the use of specific frequencies and not the entire CMRS band. The Station Authorization further precludes the assignment or transfer of any right to use the frequencies beyond that contained in the Station Authorization.

It follows that since CMRS carriers themselves do not possess the authority to deploy and use broadband signal boosters on their own networks, subscribers can not rely upon Rule 22.927 to inherit that same authority.

Broadband Signal Boosters Equipment Authorizations Must Be Revoked

Because Rule 22.927 authorizes mobile stations and not broadband signal boosters, the entirety of Wilson arguments in these proceedings is baseless. The Commission must conclude that operation of existing broadband boosters on CMRS networks violates its rules. We urge the Commission to revoke the OET certifications for all consumer grade broadband signal booster devices that are incapable of restricting their operation to the specific spectrum allocated to that cellular system providing service to the subscriber.

According to Existing FCC Rules, Even Frequency Specific Signal Boosters Require the Consent of the Licensee and Are Not Authorized Under the Same Blanket Licensing as Handsets.

In a second filing by Russell D. Lukas, attorney for Wilson Electronics, dated August 29, 2012, he argues that, "the rules currently do not require a

subscriber in good standing to obtain carrier consent to use a properly certified consumer signal booster.” Very clearly to the contrary, FCC Rules 22.923 and 22.927, considered together explicitly prohibit the use of signal boosters. Further, they are very specific concerning what devices can be used without carrier consent. A detailed discussion of these rules and related official definitions follow.

In particular, Rule 22.923 asserts that, “Mobile stations communicate with and through base transmitters only.” The meaning and intent of this rule are crystal clear. No device may be functionally inserted between a mobile station and a wireless base station. As will be explained, without a doubt that means a signal booster may not be inserted between a handset and a base station.

Rule 22.927 states that, “Mobile stations that are subscribers in good standing to a cellular system, when receiving service from that cellular system, are considered to be operating under the authorization of that cellular system.” This rule applies exclusively to mobile stations, and it is important to understand that a signal booster is not a mobile station, either by itself or considered together with one or more wireless handsets. This follows directly from FCC definitions found in Parts 2 and 22.

As a practical matter, the Rule 22.927 was enacted to simplify the purchase of cellular handsets by consumers. The rule is compatible with operation of the wireless networks only because the handsets, which satisfy the definition of a mobile station, are under the direct control of those networks. That is definitely not the case for broadband signal boosters, which do not satisfy the definition of a mobile station. In fact, it is precisely because they are not controlled by the networks that broadband boosters today are causing interference of epidemic proportions.

Returning to the precise and carefully chosen language of Rule 22.927, a mobile station, defined in Part 22.99, is “one or more transmitters that are operable while in motion.” This definition, together with fundamental engineering principles, leads to the inescapable conclusion that neither a signal booster, nor a signal booster in combination with a wireless handset is a mobile station. To that end, Fig. 1 shows the essential components of a transmitter. Those components include a modulator, an oscillator or frequency source, and an amplifier. Further, it is seen that a transmitter is a two-port device, with a baseband signal at its input, and a modulated carrier at its output. A “port” is the engineering term describing a two-wire pair, a length of transmission line, or a length of waveguide that provides an electronic connection, which is a signal path, between the device and its external environment.

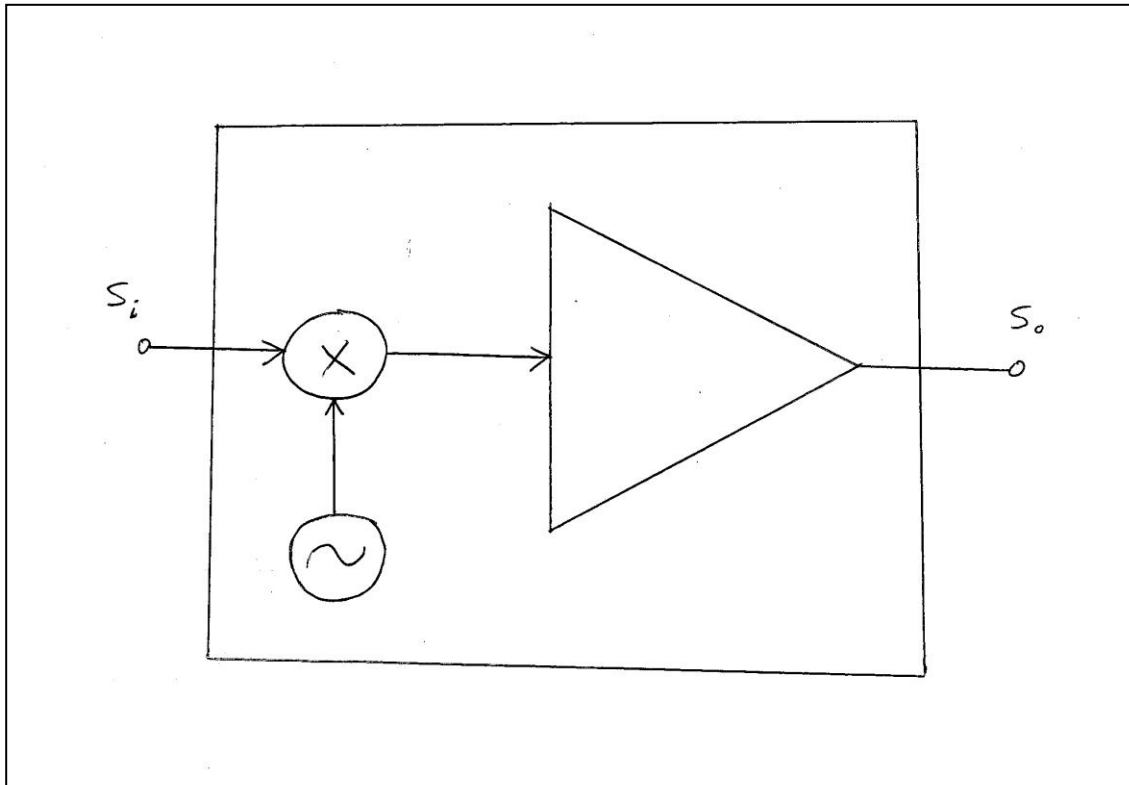


Fig. 1. The essential components that define a transmitter are a modulator, an oscillator or frequency source, and an amplifier. Further, the transmitter is a two-port device with a baseband signal at its input and a modulated carrier at its output.

In contrast, the essential component of a signal booster is a bidirectional amplifier (BDA), as shown in Fig. 2.

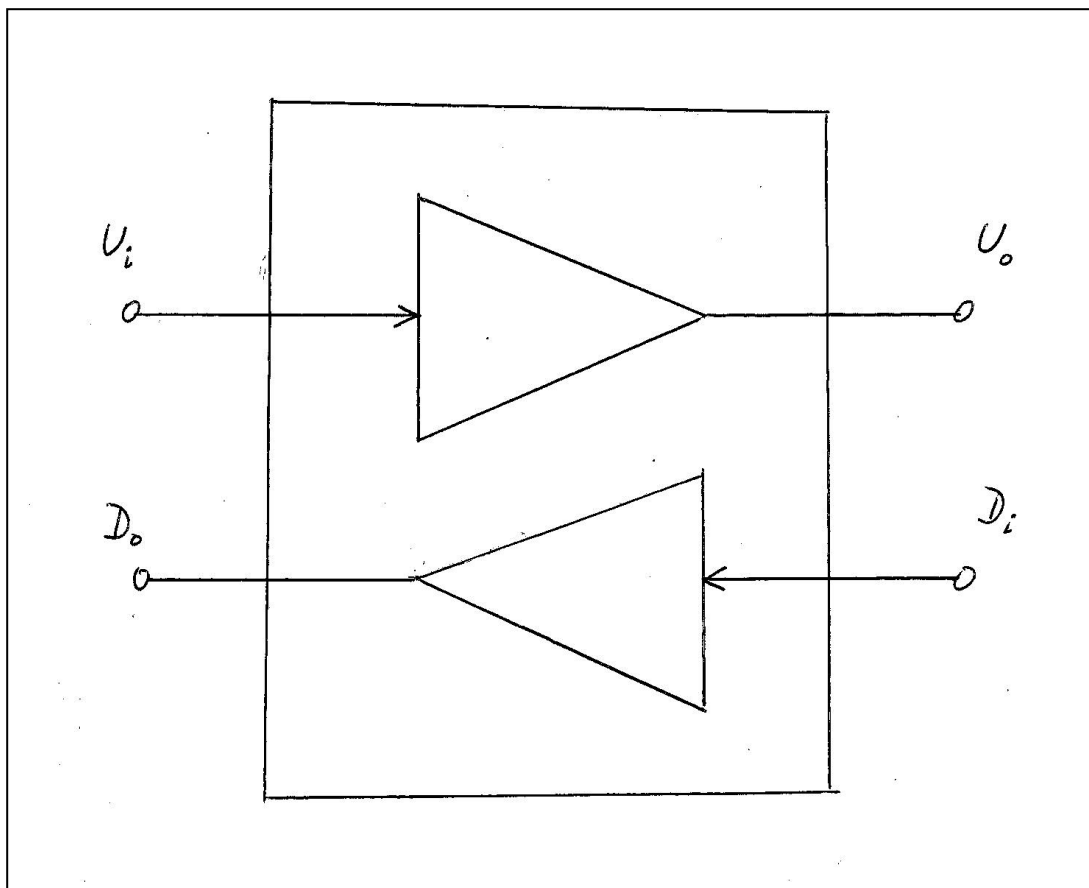


Fig. 2. The essential component of a signal booster is a bidirectional amplifier, or BDA, which is a four-port device and not a transmitter. In fact, the two separate amplifiers operating on the uplink and downlink wireless signals separately satisfy the official FCC definition of an External Radio Frequency Power Amplifier, or ERFPA.

In a BDA, the uplink and downlink amplifiers separately satisfy the FCC Rule 2.815 definition for External Radio Frequency Power Amplifier (ERFPA). According to that definition, "an external radio frequency power amplifier is any device which, (1) when used in conjunction with a radio transmitter as a signal source is capable of amplification of that signal, and (2) is not an integral part of a radio transmitter as manufactured."

Further, it is seen that a BDA is a four-port device, while, in contrast, a transmitter is a two-port device. So, a BDA is not a transmitter, neither functionally nor structurally. The number of ports is important because they largely determine the complexity and functionality of the device by

controlling the flow of signals between it and the rest of the universe. The complexity of that flow increases geometrically with the number of ports. So, a BDA with four ports is four times more complicated than a transmitter or a station with two ports. Similarly, a BDA in combination with a transmitter, which is a system with a total of six ports, is nine times more complicated than a transmitter or station alone. It follows that the chances for unanticipated interactions or interference also increase geometrically. In fact, in the case of broadband signal boosters, that is exactly what is being observed

It is worth noting that perhaps too much credit is given to BDA's when they are depicted in the manner of Fig. 2. Functionally, the same device could be re-drawn as in Fig. 3 below:

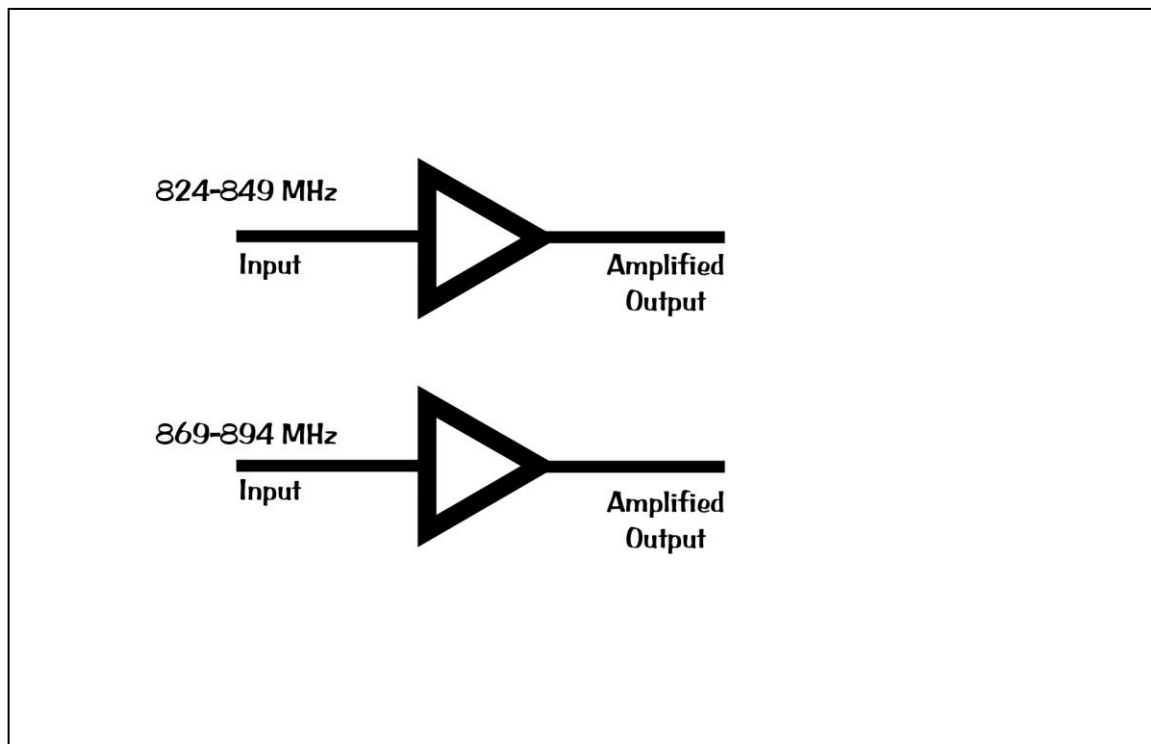


Fig 3. When drawn as shown, the broadband booster is more clearly shown to be nothing more than two External Radio Frequency Power Amplifiers.

Figure 3 clearly shows a BDA to be a pair of External Radio Frequency Power Amplifiers. As shown, they are capable of amplifying any signals arriving at their respective input terminals regardless of origin. In the case of signals originating from one or more mobile stations, the ERFPA's shown above will

indiscriminately amplify those signals regardless of CMRS carrier affiliation in direct contravention to the CMRS' Station Authorization.

From the above, it is seen very clearly that neither a BDA nor a signal booster may be regarded as a transmitter. They are External Radio Frequency Power Amplifiers. In fact, the OET certifications for the present generation of signal boosters are for amplifiers, not for signal boosters. More specifically and again by way of example, the Wilson Slek Model Booster certified under OET Equipment Authorization # PWO2B5225 is entitled by the Telecommunication Certification Body providing that authorization as "Product Type: Bi-Directional Amplifier" and not as a transmitter, mobile station or simply station. Clearly, even the testing bodies believe these devices to be amplifiers and not transmitters or stations.⁵

The questions remains, Can a signal booster in proximity to a handset, as shown in Fig. 4, be regarded as a transmitter?

⁵ <https://apps.fcc.gov/eas/GetApplicationAttachment.html?id=1168087>

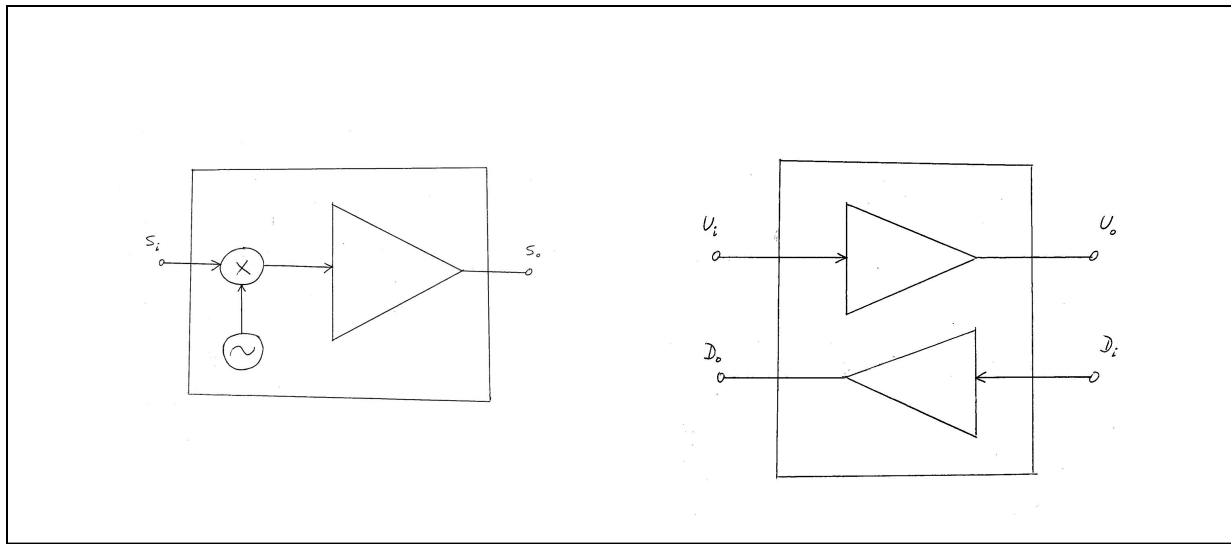


Fig. 4. Can a BDA in proximity to a transmitter be regarded as a new transmitter? The inescapable conclusion is "No." The combination is a six-port device with connections between ports that are at best vaguely defined functionally, mechanically, and electronically. Further, there are indeterminate connections between the ports of the BDA and multiple other, unknown devices.

It is seen that the combination of a transmitter and a BDA is at least a six-port device structurally, and depending upon what other devices are in proximity there could be many more ports. As a practical example, a BDA in a bus, taxi, minivan or boat can functionally connect with multiple transmitters. Each transmitter adds two more ports to the total.

It is further seen that functionally the combination of a transmitter and a BDA is not defined. The distance between the two can vary over an indefinite range, and the connection between them is not hardwired. That means unintentional devices can connect to the BDA. For example, a BDA is intended as a signal booster for one transmitter on a particular wireless service can unintentionally serve as a signal booster for other transmitters on other wireless services.

In the idealized configuration, the transmitter output port S_o is connected to the BDA input port U_i ; however, even that configuration is not just a transmitter. There are two ports from the BDA still dangling. Further, both the uplink and downlink amplifiers still separately satisfy the definition of an External Radio Frequency Power Amplifier. In the most favorable interpretation, the transmitter is connected to an external power amplifier at its output. It is still not just a transmitter, and, therefore, it is not a mobile

station. Since it is not a mobile station, it requires the consent of a wireless network licensee.

As a practical matter, the external amplifiers cannot be interpreted as mobile stations according to Rule 22.927 because they are not under the direct control of the wireless network, and they are free to interfere with it. In contrast, cellular handsets are mobile stations, and they are under the direct control of the wireless network.

Intelligent Signal Boosters Inherently and Individually Obtain Explicit Carrier Consent.

In contrast to broadband signal boosters, intelligent signal boosters cannot operate without a valid memory card. That card is issued by the wireless carrier or by its designated distributor and restricts operation of the device to frequencies described in the Station Authorization held by the CMRS licensee providing service to the subscriber. In that way, each individual wireless booster has the explicit consent of the wireless carrier(s) issuing the card.

Public Knowledge Recognizes the Importance of Signal Boosters During Emergencies; However, that Still Does Not Justify Blanket Licensing.

In a filing dated November 30, 2012, Public Knowledge suggests that signal boosters do not require carrier authorization because “interoperable” handsets are required by the FCC for the 4G LTE (Long Term Evolution) wireless networks. By “interoperable” is meant that a specific brand and model of handset, such as the Apple iPhone, cannot work exclusively on only one wireless network. It must be readily adaptable, by a simple change of SIMM card, for example, to other networks.

Smart Booster finds the above comparison curious and disagrees, for the reasons discussed previously here in detail. That is, equating a handset with a signal booster is comparing apples and oranges. As previously explained, a handset is a mobile station, which incorporates a complete transmitter. A signal booster is not a mobile station, and by itself, cannot communicate with anything. A handset qualifies for blanket licensing according to FCC Rule 22.293. A signal booster emphatically does not.

We also disagree with Public Knowledge’s assertion that a signal booster somehow attaches to a network, and that as a result, carriers should not be empowered to place restrictions on that attachment. To the contrary, as

clearly shown in the above figures, broadband BDA's are merely amplifiers and they amplify whatever happens to come their way. From the operational perspective of the BDA, the presence of a network is actually unnecessary, and hence, it strains credulity to suggest that an "attachment" is created or made simply by use. Even if one were to conclude that an "attachment" does exist, that attachment provides no meaningful operational control of the broadband signal booster by the CMRS licensee. Furthermore, such an attachment would not necessarily be a single attachment to a single network, transmitter or station.

Conclusions

It has been shown that present FCC rules do not in any way, shape, or form permit broadband signal boosters without carrier consent. They are not mobile stations, either by themselves or in proximity to a handset, and only mobile stations are permitted under blanket licensing. Further, it has been shown that intelligent signal boosters individually and explicitly obtain carrier consent and they do not require blanket licensing.

From the above, it follows that the present generation of signal boosters are operating in violation of present FCC rules, and as a result are causing interference to wireless networks of epidemic proportions. They should be deactivated and removed from the market place.

The accumulated and growing evidence for interference by broadband signal boosters is damning. With respect to preventing interference to wireless networks, while providing reliable wireless communication to rural America, broadband boosters are not the solution. They are the problem. To fix the problem OET certifications for broadband boosters must be revoked. Otherwise, the problem will continue to grow unchecked. It is already of epidemic proportions.

The longer the FCC avoids making the right decision, that is, revoking the certification of broadband signal boosters, the worse the problem will become. Wireless networks are becoming more sophisticated in their features and consequently more vulnerable to interference. At the same time, broadband boosters are proliferating unchecked. As a result, the wireless networks are already seriously compromised with respect to capacity. Unless the FCC acts decisively, the wireless networks will be crippled.

Until broadband boosters are removed from the marketplace, consumers will continue to purchase them in preference to intelligent boosters based upon a simple price comparison. Consumers will not spend \$300 or \$400 for intelligent boosters when they can purchase broadband boosters for only \$89.95. Broadband boosters are analogous to an automobile without either steering or brakes. They are less expensive than a fully equipped automobile, but they end up going where they are not supposed to go, and they cannot stop when they get there. The result is that the consumer ultimately is harmed.

Broadband boosters might be considered as the first generation of signal boosters or 1G Boosters, except they were never legal according to FCC Rules. In any case, the time is long overdue for the next generation of boosters, the intelligent booster.

Respectfully submitted,

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A handwritten signature in cursive script, reading "Jeremy K. Raines, Ph.D., P.E.", positioned above a solid horizontal line.

Jeremy K. Raines, Ph.D., P.E.
For Millard / Raines Partnership

FCC 2.803 Compliance Notice:

Prototype - Not for Sale

The Smart Booster device has not been authorized as required by the rules of the Federal Communications Commission. This device is not, and may not be, offered for sale or lease, or sold or leased, until authorization is obtained.